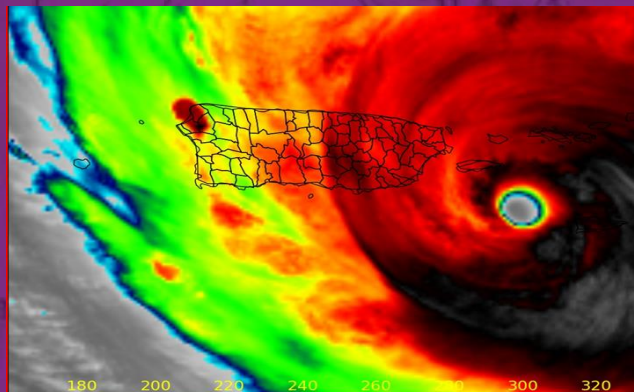


Puerto Rico...

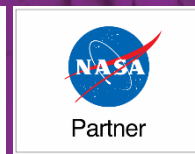
Challenges Ahead



Ada R. Monzón

Chief Meteorologist
WAPA-TV Noticentro al Amanecer;
WKAQ-580 am;
Noticel News;

Founder and BOD President
EcoExploratorio:
Museo de Ciencias de
Puerto Rico



2021

CHALLENGES

Natural Multi-Risk Challenges:

- Active Hurricane Season
- Active Seismic Sequence (2019-current)
- COVID-19 Pandemic
- Recovering from Hurricane María (2017)-catastrophic
- Climate Change

Social/Economic Challenges:

- Mental and physical health
- Financial impact
- Reduced capacity to support response (personnel and supplies)
- Rise in food insecurity

Plus...Our Science icon collapsed



**The
Arecibo Observatory**



Another heart wrenching moment



2020/12/01 07:53:50



Natural Hazard COMMUNICATION CHALLENGES

- **Warning systems are fragile**
- **General communication between agencies/ municipalities/state govt. can be weak**
- **New government administration has not been completely trained**
- **Resources in general are limited**
- **People are tired and frustrated**
- **They have become “seismometers”**
- **Fake news are rising**
- **General mistrust of response to natural hazards**

SOCIAL MEDIA IS STILL A FAVORITE SOURCE OF INFORMATION






Tsunami Advisory – January 7, 2020

Tsunami Advisory – January 9, 2018

Message: PR/Virgin Isl. Warn/Adv./Watch #2
Issued Wed Jan 10 03:41:43 UTC 2018

Tsunami Advisory

Earthquake:
Magnitude: 7.6
Depth: 21 mi.
Location: NORTH OF HONDURAS
Origin Time: 10/01/2018, 03:51:31
Lat: 17.5° N Lon: 83.6° W

-  - **Advisory** Puerto Rico Issued at: 1/9/2018, 9:58:39 PM
-  - **Advisory** Virgin Islands Issued at: 1/9/2018, 9:58:39 PM
-  - **Potential Threat** Cayman Islands Issued at: 1/9/2018, 9:57:25 PM
-  - **Potential Threat** Cuba Issued at: 1/9/2018, 9:57:25 PM
-  - **Potential Threat** Nicaragua Issued at: 1/9/2018, 9:57:25 PM

Previous 40 Tsunami Messages

Issued *	Origin Time *	Mag	Depth	Lat	Lon	Location	Messages	Additional
01-10-2018 02:59:01	01-10-2018 02:51:32	7.8	21 Mi.	17.5° N	83.6° W	IN THE CARIBBEAN SEA	GoM/East Coast Info #1	Select Res

...TSUNAMI INFORMATION STATEMENT...

**** NOTICE **** NOTICE **** NOTICE ****
NOTICE **** NOTICE *****

THIS STATEMENT IS ISSUED FOR INFORMATION ONLY IN SUPPORT OF THE UNESCO/IOC TSUNAMI AND OTHER COASTAL HAZARDS WARNING SYSTEM FOR THE CARIBBEAN AND ADJACENT REGIONS AND IS MEANT FOR NATIONAL AUTHORITIES IN EACH COUNTRY OF THAT SYSTEM.

NATIONAL AUTHORITIES WILL DETERMINE THE APPROPRIATE LEVEL OF ALERT FOR EACH COUNTRY AND MAY ISSUE ADDITIONAL OR MORE REFINED INFORMATION.

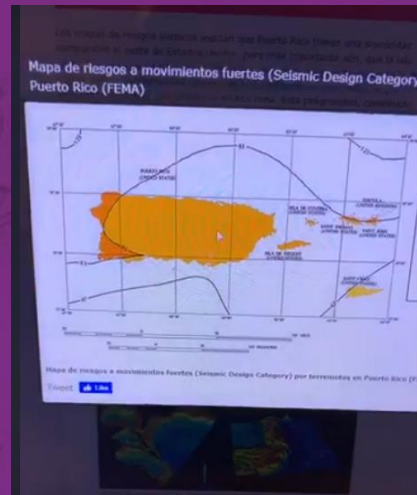
**** NOTICE **** NOTICE **** NOTICE ****
NOTICE **** NOTICE *****

PRELIMINARY EARTHQUAKE PARAMETERS

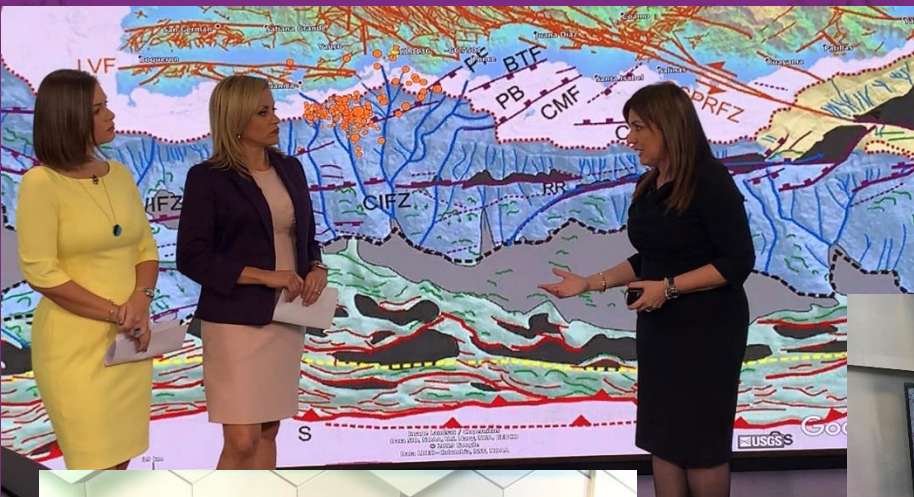
* MAGNITUDE 6.6
* ORIGIN TIME 0824 UTC JAN 7 2020
* COORDINATES 17.9 NORTH 66.8 WEST
* DEPTH 7 KM / 4 MILES
* LOCATION PUERTO RICO REGION

Earthquake and Tsunami

- Social Media audience need quick response
- Messages; calm, normal, if something stronger will follow, deal with myths: fracking, and other fake news through whatsapp
- Focused on Individual response
- Problem of expectations-great interest and anticipation for guidance



Around 50 Facebook Lives – Earthquake Related Information, Recommended Actions, Education, Community Updates



MEDIA



Balance between Information and Excessive Warning

- Constant process between the media and the recipient
- Based on professionalism and the right information
- Avoiding reviews
- Adding empathy and sensitivity helps carry the message
-



Natural Multi-Risk Challenges

2020 Atlantic Hurricane Season

by the numbers



13

Hurricanes
Average season
has six

6

Major hurricanes
Average season
has three

12

Storms hit the U.S. coastline, (5 of which came ashore in Louisiana)
Previous record: 9 in 1916

10

Named storms that formed in September

Most for any month on record

10

Rapidly intensifying storms sampled
by NOAA and the U.S. Air Force

30

Named storms

Arthur	Paulette
Bartha	Rene
Cristobal	Sally
Dolly	Teddy
Edouard	Vicky
Fay	Wilfred
Gonzalo	Alpha
Hanna	Beta
Isaias	Gamma
Josephine	Delta
Kyle	Epsilon
Laura	Zeta
Marco	Eta
Nana	Theta
Omar	Iota



NOAA Hurricane Hunters

86

Missions conducted

102

Hurricane eyewall passages

678

Flight hours

1,772

Dropsondes deployed
to gather vital atmospheric data



NOAA underwater hurricane gliders

47

Glider deployments

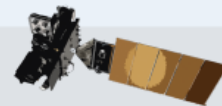
13,272

Gathered observations

179,401

Temperature and salinity profiles

These help improve forecasts for current storms



16

NOAA weather satellites in operation

5th

consecutive above-normal season

Previous record: 4 from 1998 to 2001

86

Facebook Live broadcasts

from the National Hurricane Center



Active Seismic Sequence

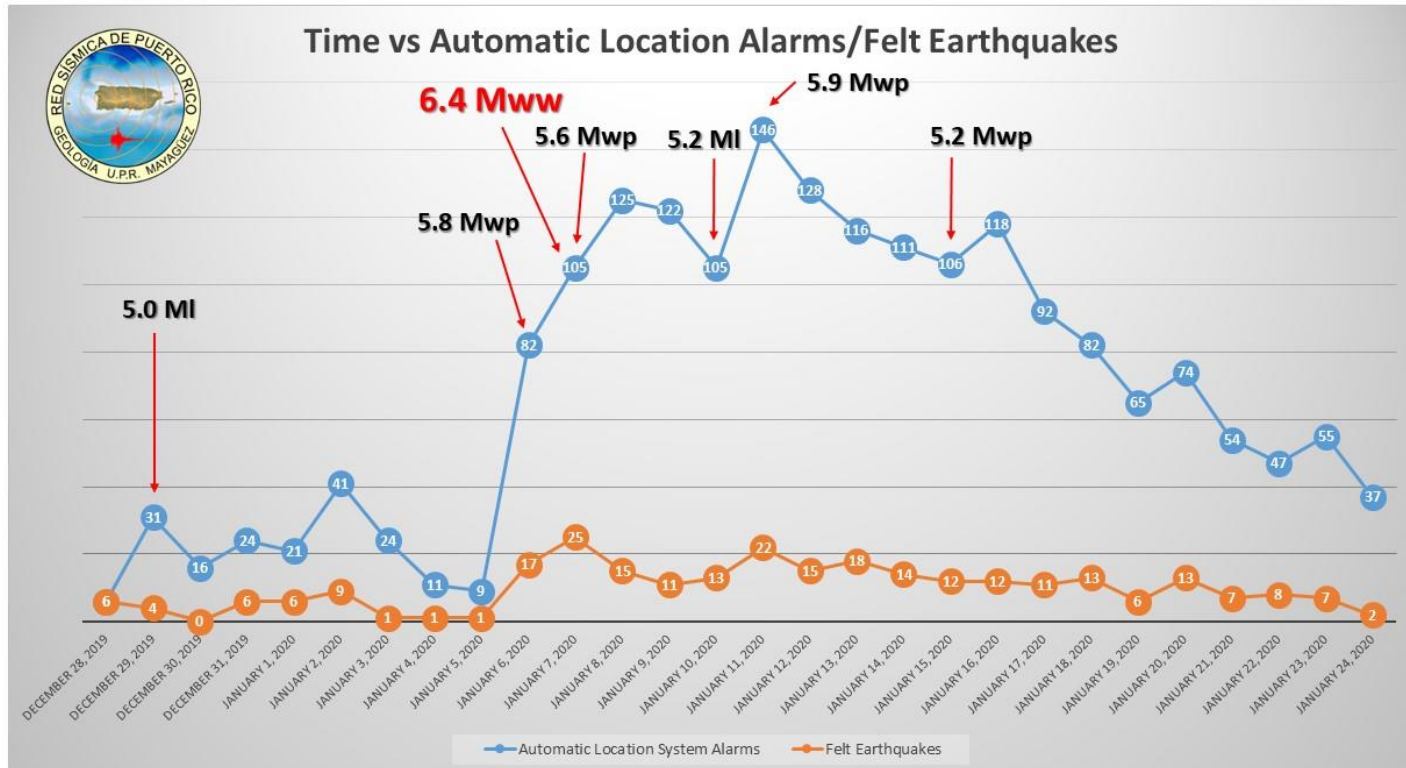
SEISMIC SEQUENCE-

December 28th, 2019-current

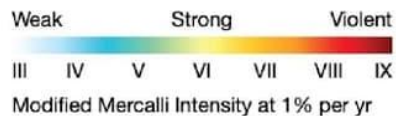
+13,000 earthquakes

6.4 magnitude (Jan. 7th, 2020)

1 direct death



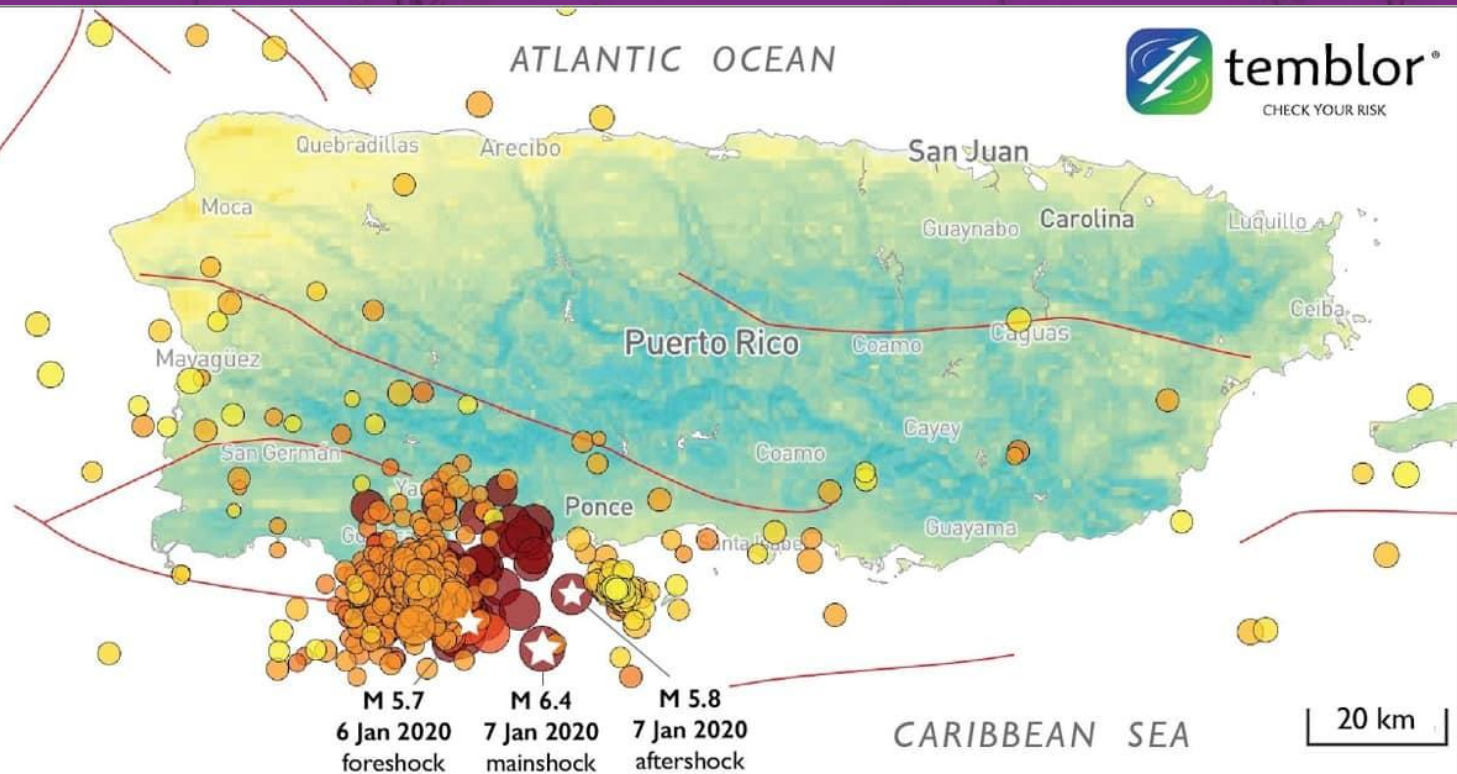
Strongest shaking likely in your lifetime



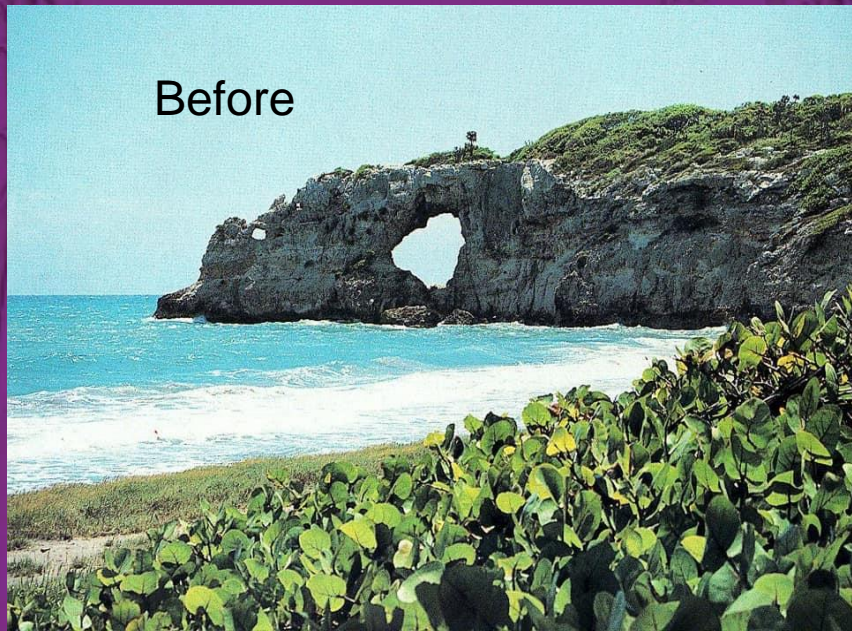
Earthquakes



as of 15:25 UTC 11:25 am AST



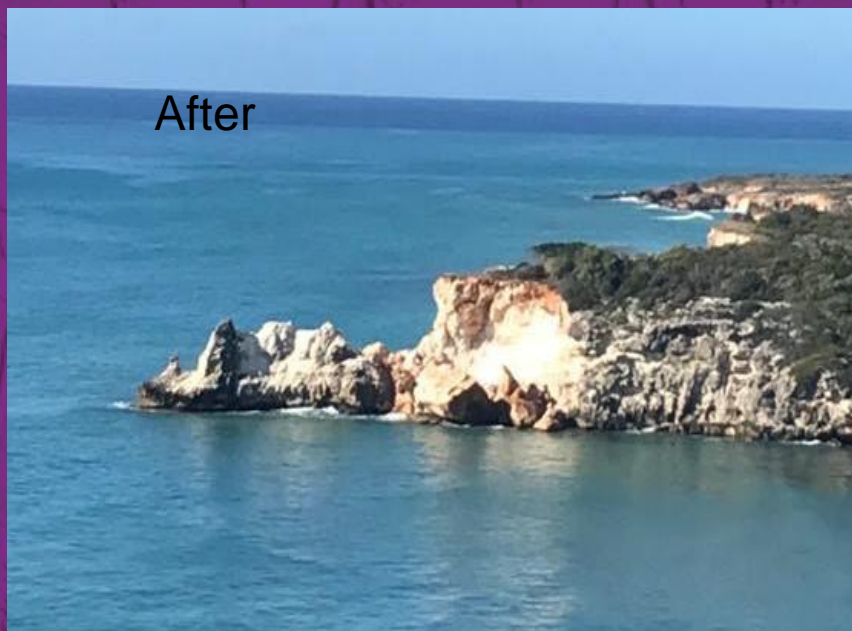
Before



Before

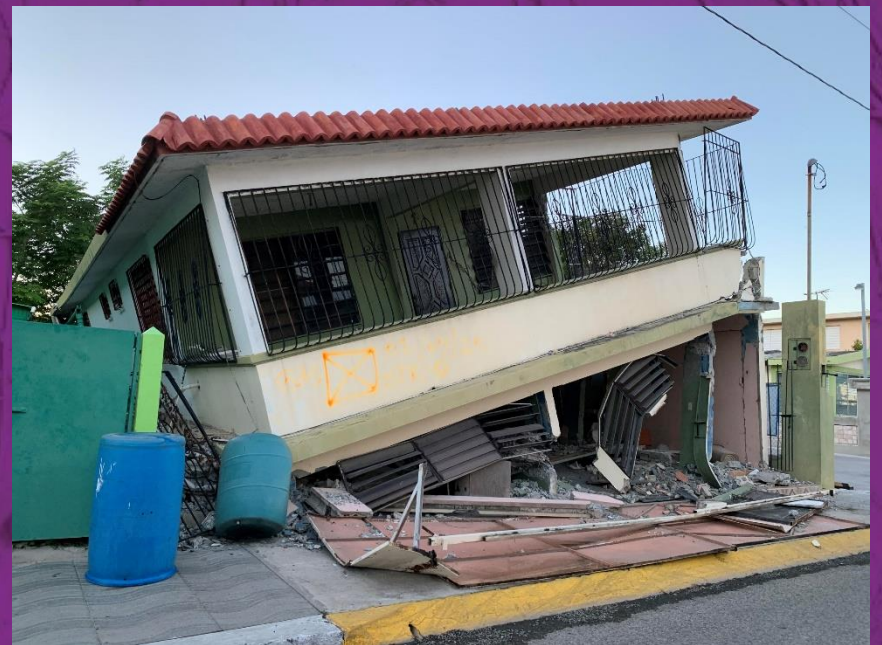


After



After







Escuela Agripina Seda con daños después de temblor 5.8 1/6/2020 sin colapsar



Después del terremoto 6.4 1/7/2020

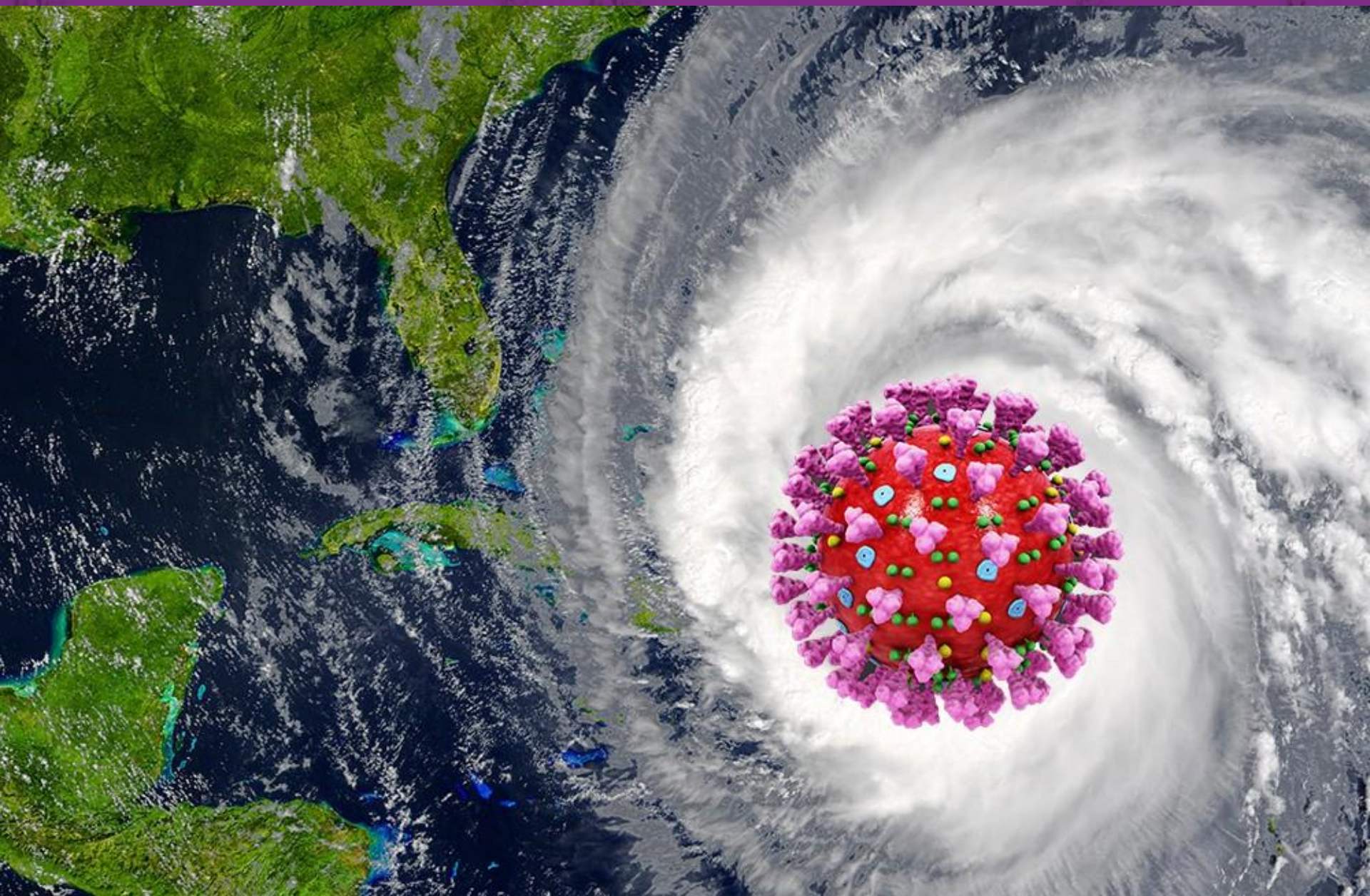


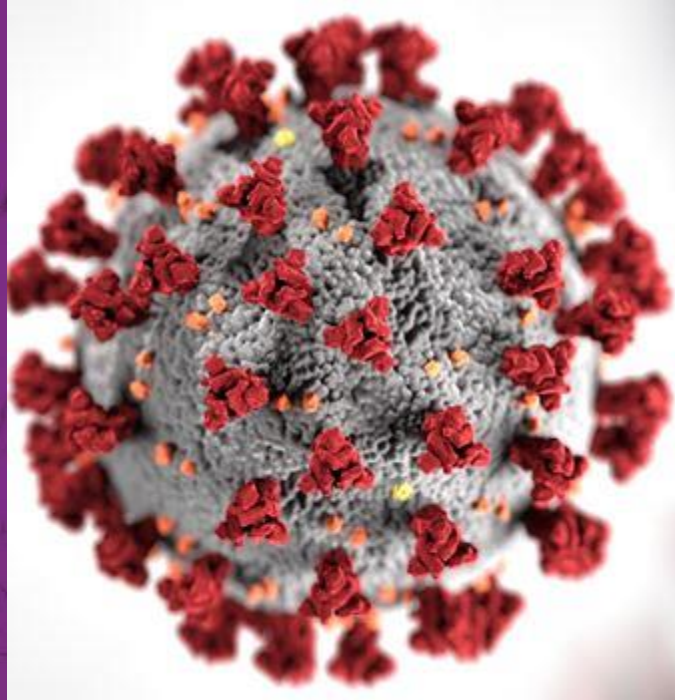
GILLIGHAN ISLAND, GUÁNICA NEAR 12" SINKING





COVID-19 Pandemic





COVID-19

CORONAVIRUS DISEASE 2019



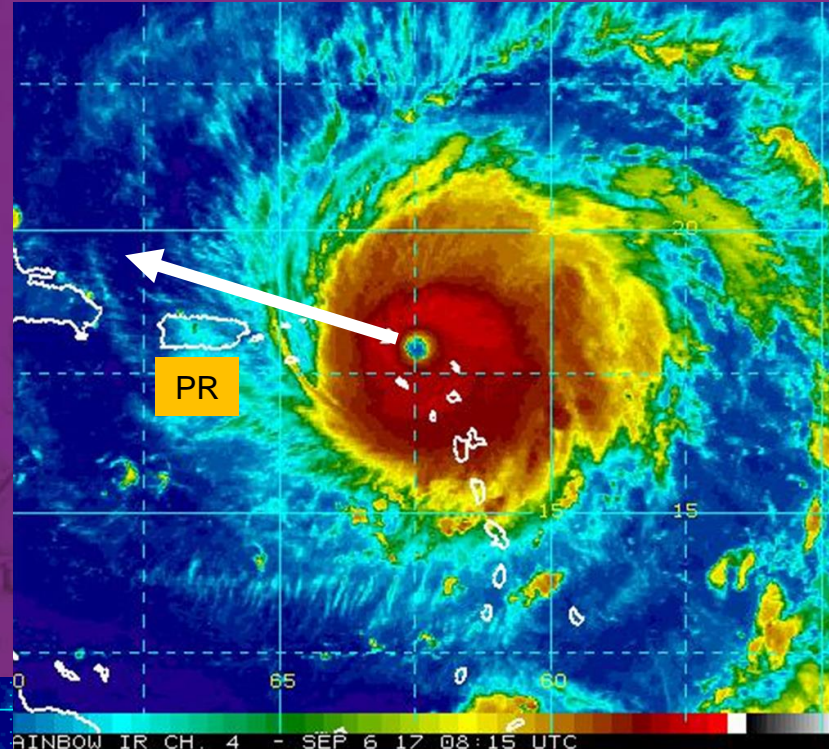
SHELTER CHANGES: capacity, tests, using hotels, etc.



Recovering from Hurricane María (2017)- catastrophic

IRMA

Sept. 6, 2017

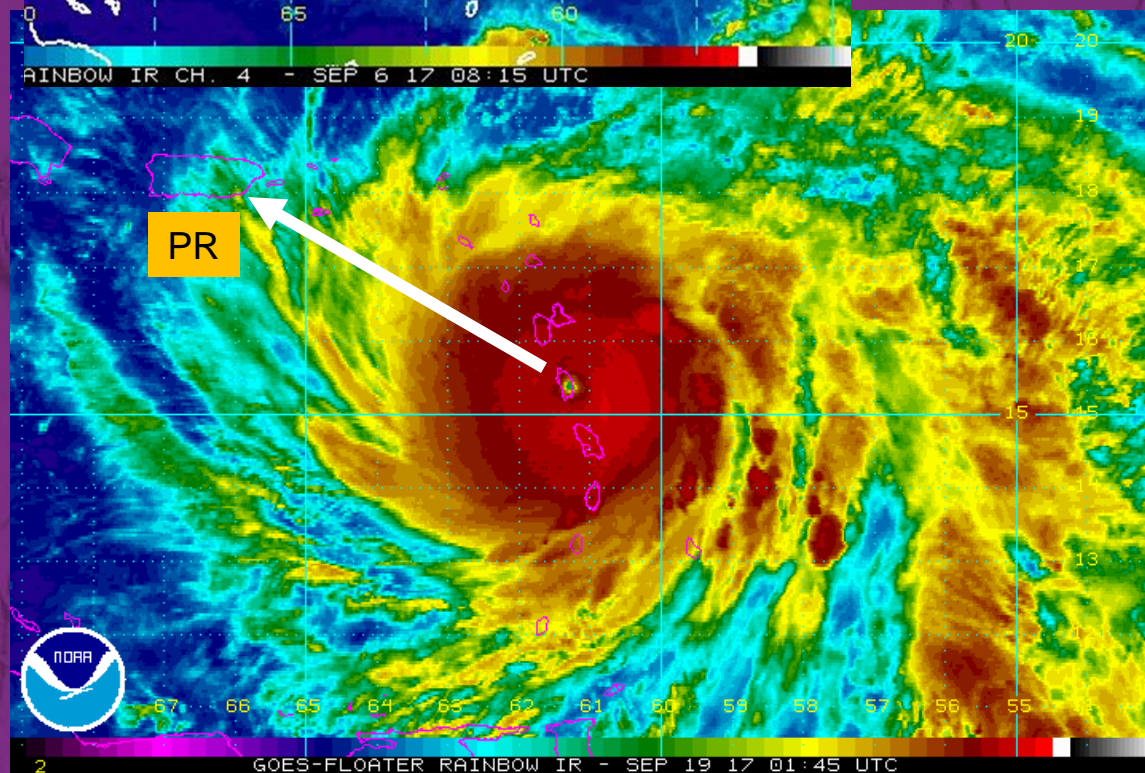


2017

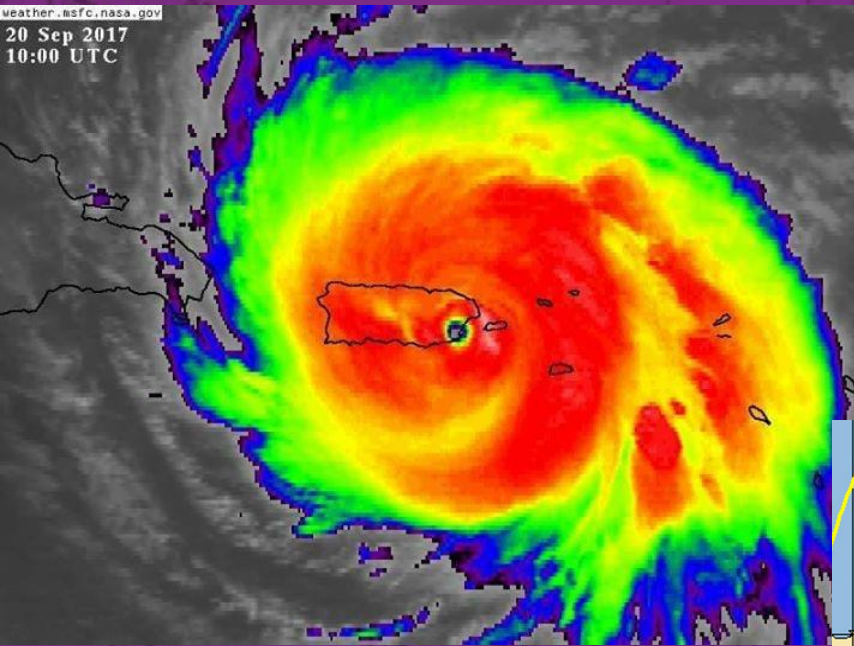
MULTIPLE THREATS

MARÍA

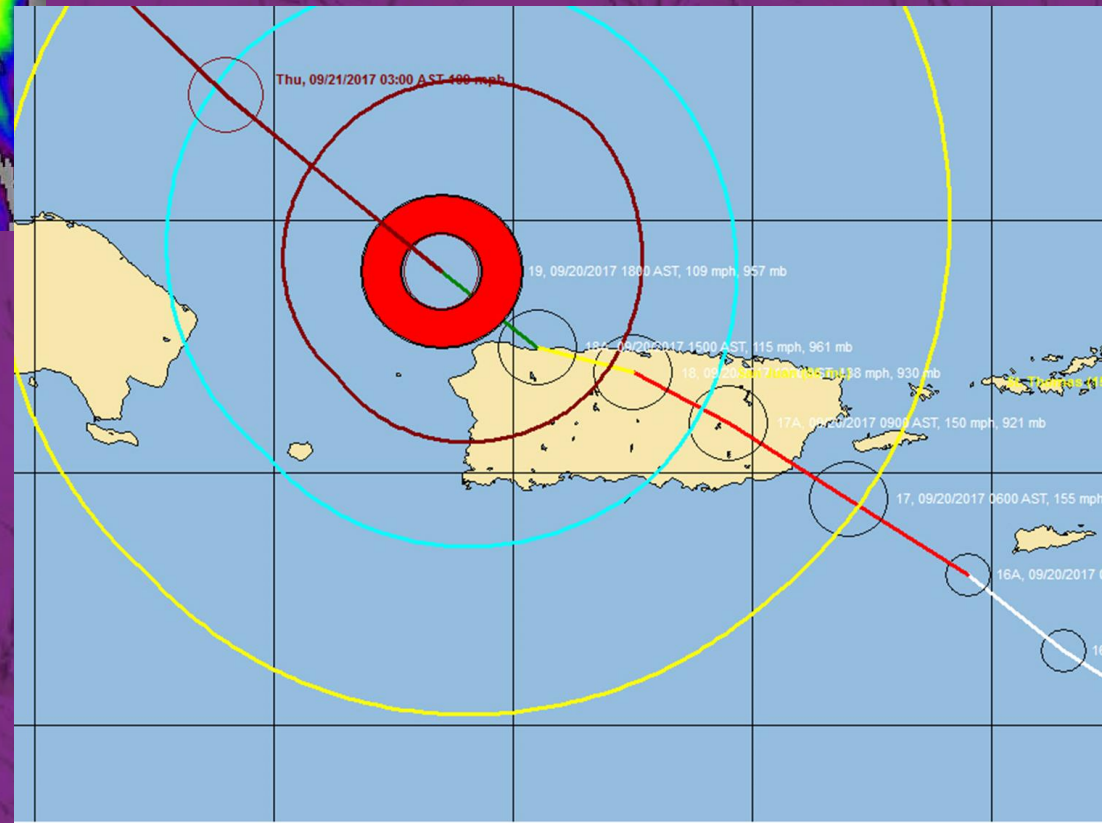
Sept. 19, 2017



HURRICANE MARÍA - September 20th, 2017



Cat. 4-155 mph, 926 mb
2,975 deaths
70,000 landslides
~\$90 billion damages



San Felipe (1928)

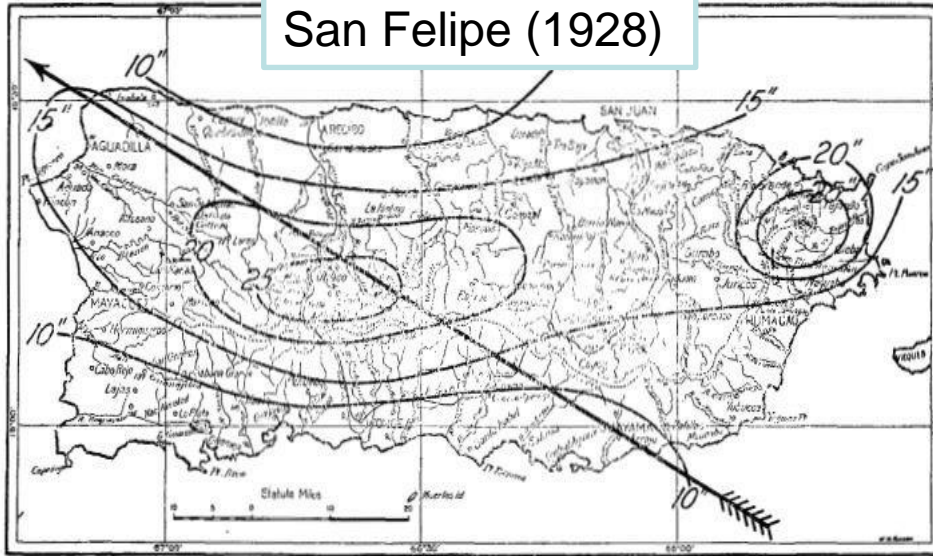


FIG. 3.—Rainfall distribution in Porto Rico hurricane, September 13, 1928

María (2017)



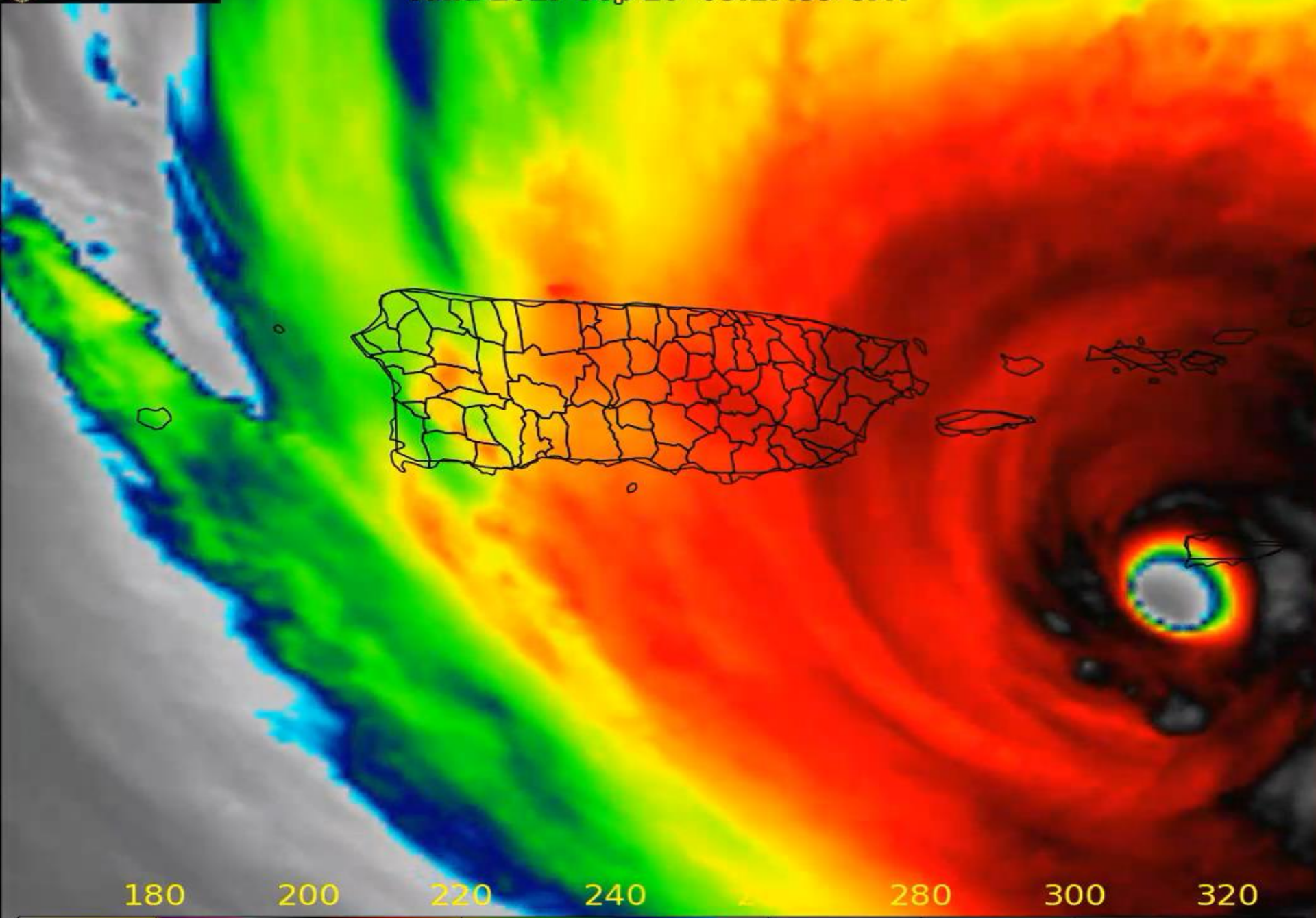
The Two Most Powerful Hurricanes over Puerto Rico



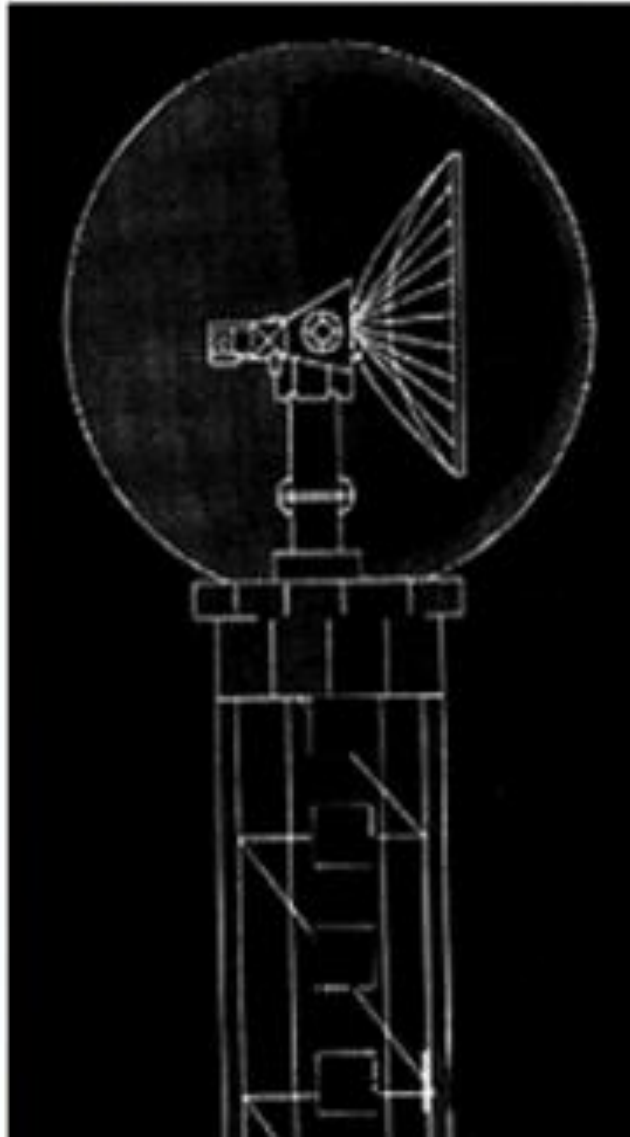
San Felipe 2do (1928)



María (2017)



NWS-San Juan NEXRAD Radar Photo & Schematic BEFORE / AFTER Hurricane Maria







UPR Atmospheric Chemistry Lab @El Yunque Rainforest (2,000' ft)

Before



After







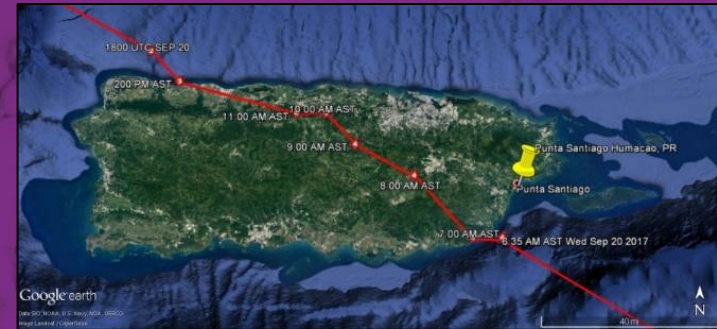
MEAL, READY-TO-EAT, INDIVIDUAL
"Repas, Prêt-à-Consommer, Individuel"
DO NOT ROUGH HANDLE WHEN FROZEN
10°F or below





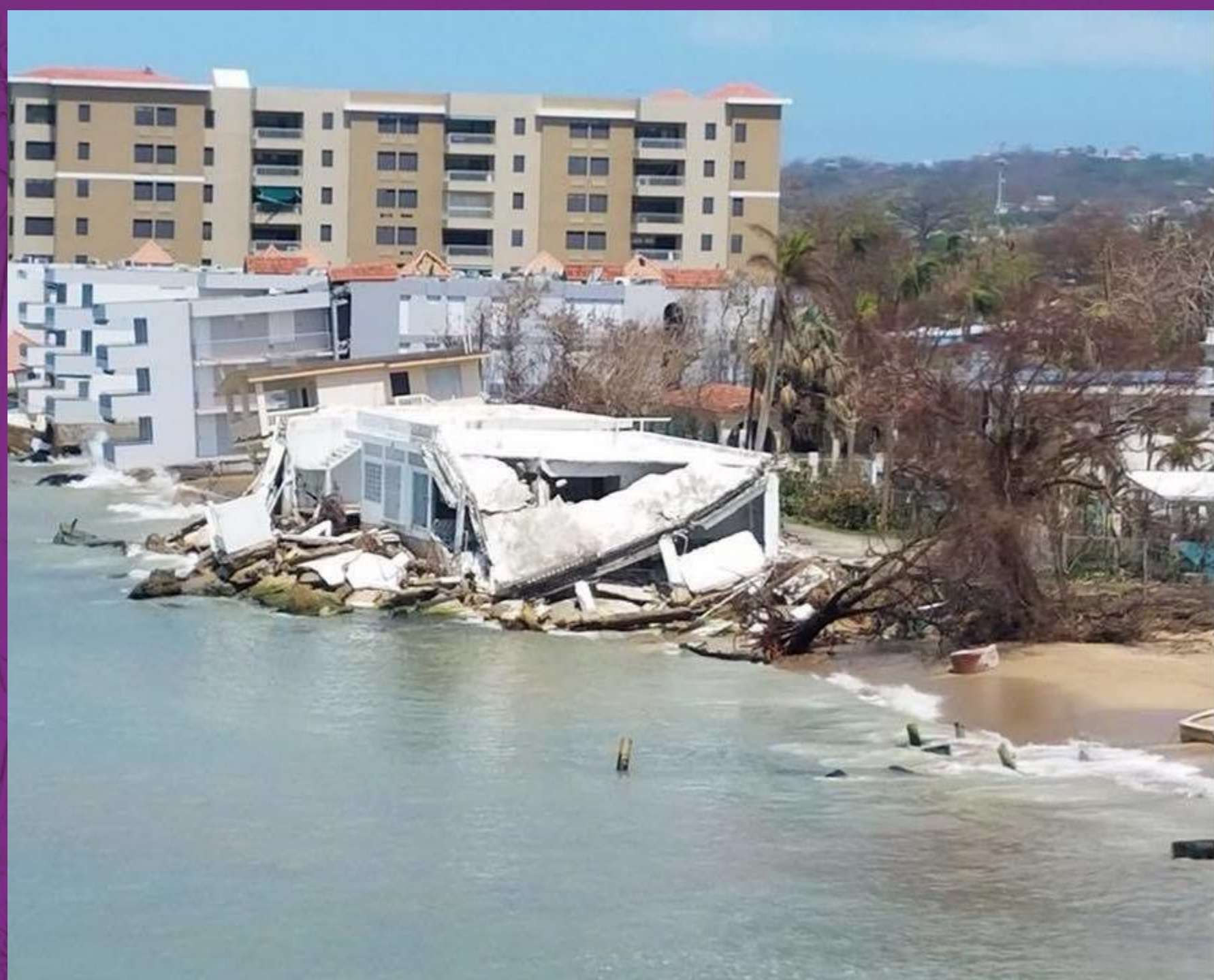
Storm Surge

Punta Santiago, Humacao, PR



Measured still water mark inside the houses ~40-55"





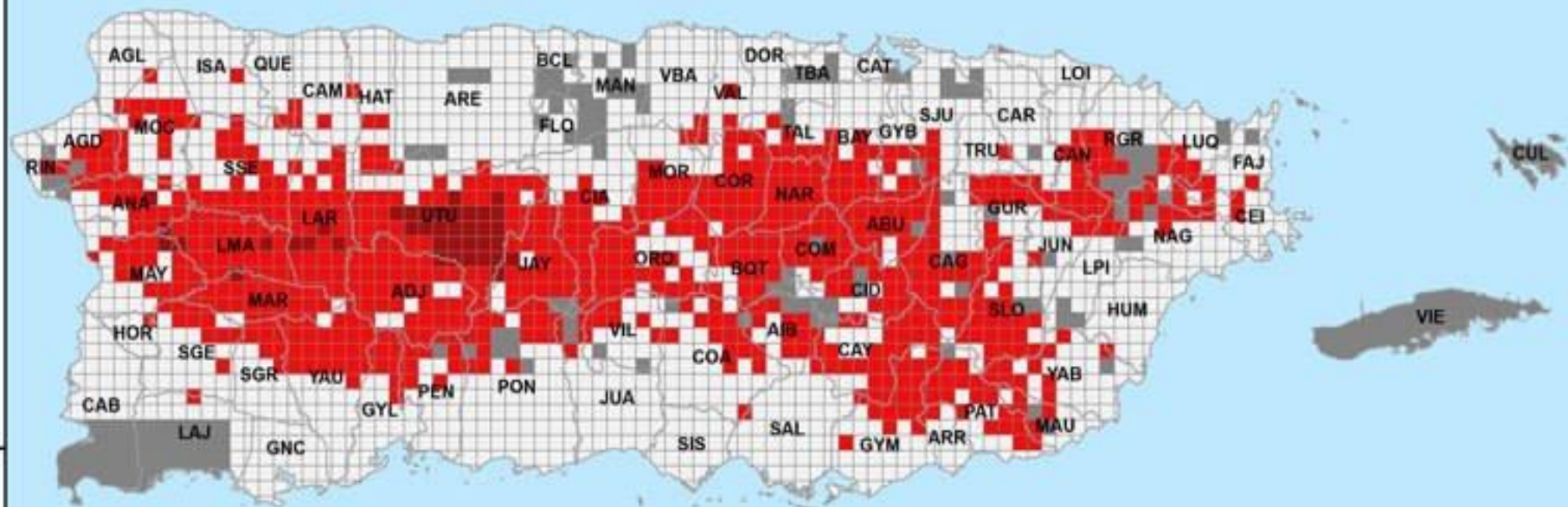


Barrio Ingenio,
Toa Baja
La Plata River





Map showing concentration of landslides caused by Hurricane Maria, Puerto Rico



Explanation

Legal Municipalities



Landslide Density



Not Examined



No Landslides



Less than 25 per SqKm



More than 25 per SqKm

0 5 10 20 Miles

0 5 10 20 Kilometers

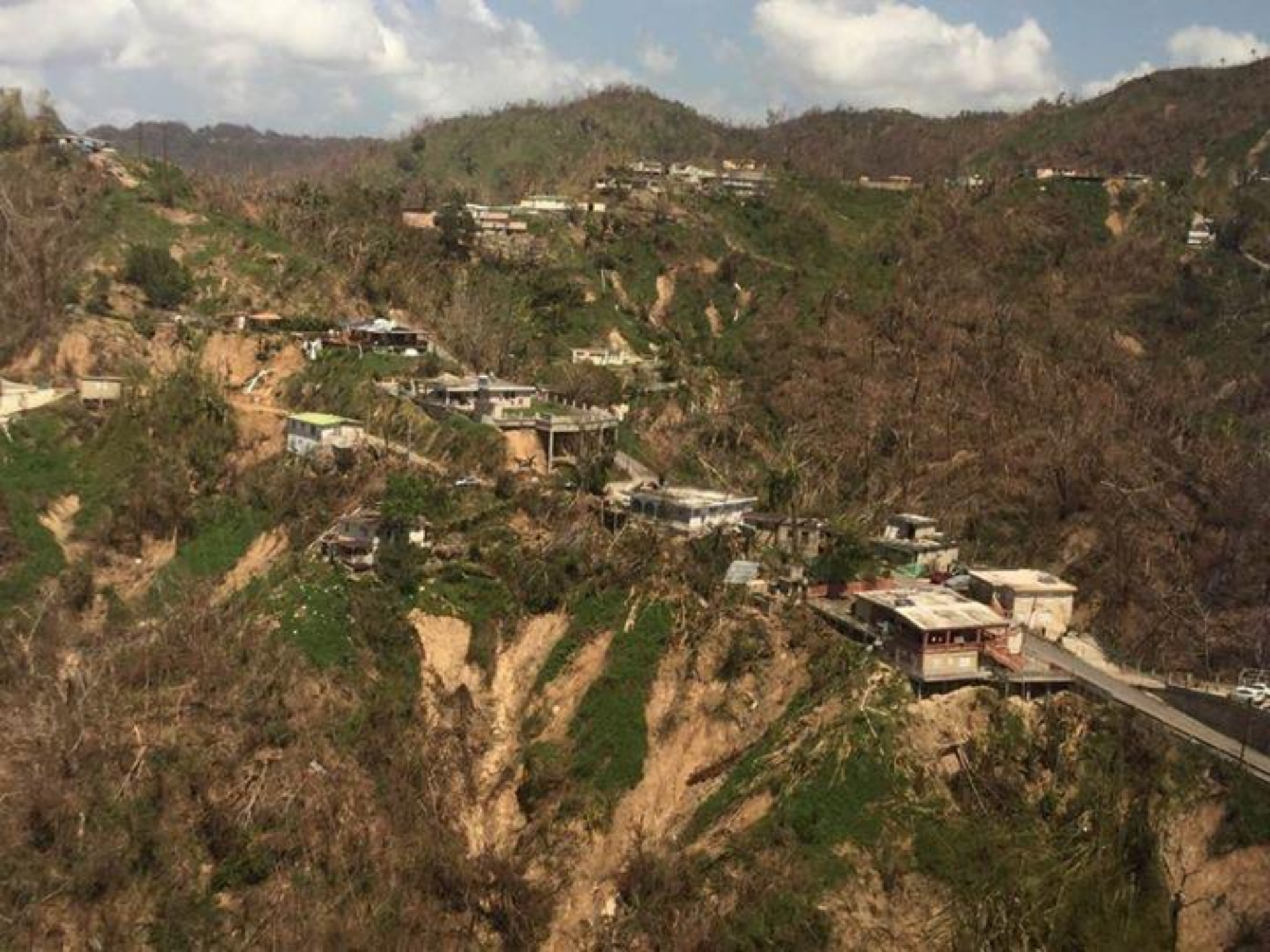
Date: 10/23/2017

Source - Bessette-Kilton, E.K., Coe, J.A., Godt, J.W., Kean, J.W., Rengers, F.K., Schulz, W.H., Baum, R.L., Jones, E.S., and Staley, D.M., 2017, Map data showing concentration of landslides caused by Hurricane Maria in Puerto Rico: U.S. Geological Survey data release, <https://doi.org/10.5066/F7JD4VRF>





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Climate Change







NATURE
Ocean Park, San Juan (Journal)

The coastal city of San Juan in Puerto Rico was flooded after Hurricane Maria hit in September 2017.





COASTAL RESILIENCE

Bouncing back & *building beyond.*

PLAN & BUILD RESILIENCE

Develop and implement plan to become more resilient.



improving forecasts, observation models, computer systems



getting information to decision makers faster



incorporating green infrastructure



DISASTER STRIKES

Disasters can be imminent or strike unexpectedly.



sea level rise



tsunamis



coastal storms and hurricanes



RESPOND

Immediately take action following a disaster.



pollution response



damage assessment imagery



completing hydrographic surveys to reopen ports



RECOVER

Assess resilience and manage adaptively.



assessing damage to communities, economy, and environment



issuing grants to rebuild and restore habitat



providing data and tools for analysis



Assess resilience and begin planning for the next disaster.

Building resilience is an iterative process.



Social/Economic Challenges



Mental and Physical Health

Experts warn that many of Puerto Rico's residents have developed mental health complications — prompted both by the present coronavirus (COVID-19) pandemic, as well as previous natural disasters and an economic depression that has been affecting the island for roughly 14 years.

Between 1,700 and 1,800 calls on a daily basis that are related to anxiety, uncertainty and fear- Psychosocial First Aid line (PAS) – AMMSCA 1 800 981 0023.

Detonators for myriad mental health problems like depression and anxiety.





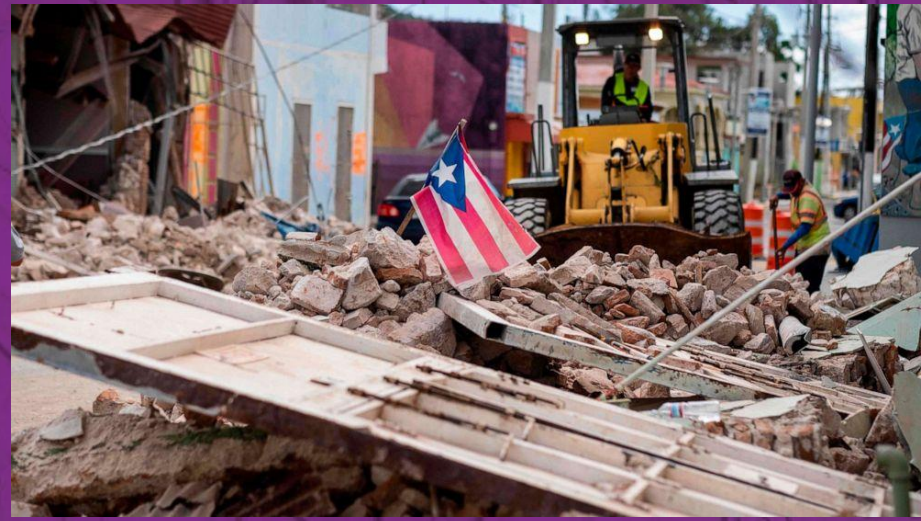
Financial Impact

According to Puerto Rico's General Union of Workers, at least 300,000 people have filed for unemployment benefits during the coronavirus crisis.

PR's financial health was already compromised, and the coronavirus/earthquake/hurricane economic hit is significant.

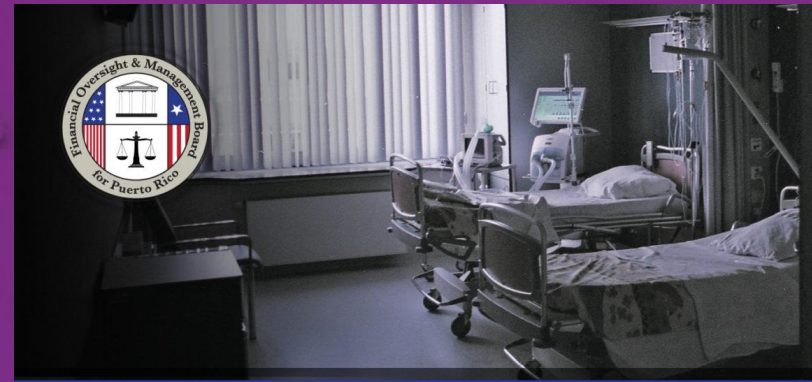
Puerto Rico has been fighting a recession for over a decade with more than \$120 billion in debt, battling multiple crisis at the same time.

Some estimates made by economists say the economic losses related to the pandemic could reach up to \$10 billion.



“The effect of the destructive hurricanes, earthquakes and COVID-19 on the economy is severe and exacerbated the lack of implementation of structural reforms to improve economic growth in Puerto Rico. That is why, with the support of the federal Government, this crisis should be an opportunity to redouble all efforts to reform the economy for the benefit of the people of Puerto Rico.”

FOMB May 26, 2020



**WEAK PUBLIC HEALTH INFRASTRUCTURE
HINDERS OUR ABILITY TO RESPOND TO
THIS AND FUTURE OUTBREAKS:**

Modernizing Puerto Rico's public health surveillance systems should be a top priority.

*By **Arnaldo Cruz**, Director of the FOMB's Research and Policy Department*

“The Oversight Board projects that the Puerto Rico economy will contract by 4.0% in this current fiscal year of 2020, with a mild 0.5% recovery in the coming fiscal year of 2021, supported by federal funds related to COVID-19, and the hurricanes and earthquakes.”

FOMB May 26, 2020



**Reduced Capacity
to support response**



CHALLENGES TO RESPOND

If a major disaster (flood, hurricane, cyclone) occurs in the next 3 to 6 months, would your organization be able to respond at the same level compared to in previous years?

68%

Our organization's response to a major disaster would be substantially reduced compared to previous years.

22%

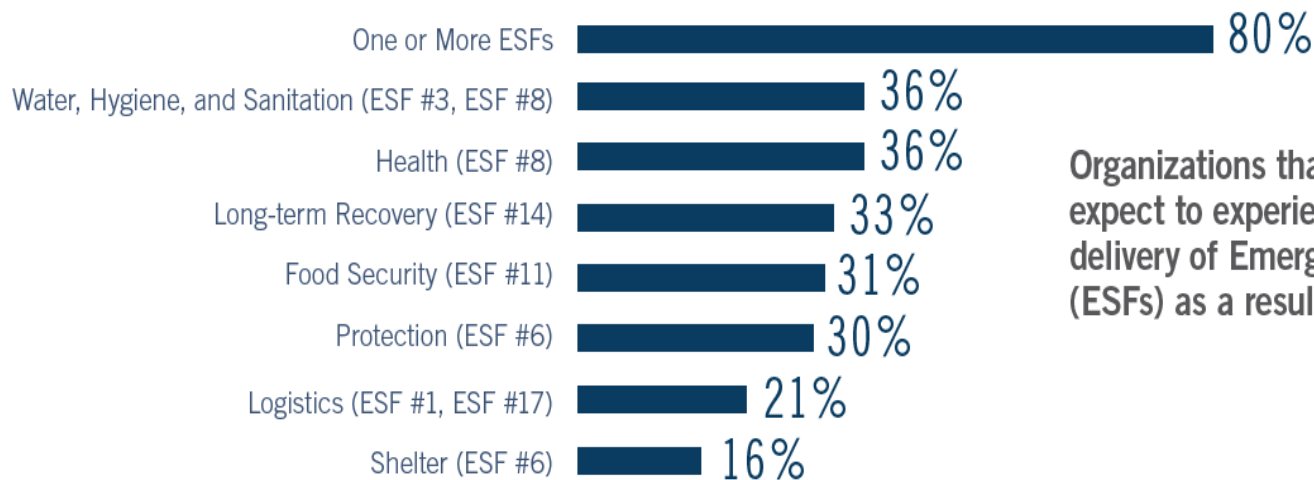
Our organization could respond to a major disaster at the same level compared to previous years.

10%

Our organization would not likely be in a position to respond to a major disaster at this time.



COVID-19 (and other or associated restrictions) present challenges to the delivery of disaster response programs and supplies



Organizations that have experienced, or expect to experience, challenges in the delivery of Emergency Support Functions (ESFs) as a result of COVID-19

The vast majority of organizations (80%) have experienced, or expect to experience, challenges in the delivery of one or more Emergency Support Functions (ESFs).

Many organizations are experiencing stock-outs of supplies that are essential to service delivery.

Many organizations have drawn down strategic, prepositioned supply reserves.



The background of the slide is a photograph of a field of grain, likely wheat or barley, with thin stalks and small heads. The image is covered with a semi-transparent purple overlay. Centered on this background is the text "Rise in food insecurity" in a bold, white, sans-serif font.

Rise in food insecurity

**20,000 households don't have
a stable roof**

**43% of Puerto Ricans live
under the poverty level.**

**This could lead to social
conflict, misery and more
migration.**

**33% of our adult population
suffer from food insecurity.**



Extreme Weather Disproportionally Impacts Vulnerable Populations

CHILDREN



ELDERLY



DISABLED



**IMPOVERISHED &
DISENFRANCHISED**





**BE PROACTIVE
NOT REACTIVE**

PRIORITIES

for 2021 Natural Hazard Preparation

1- HEALTH (physical and mental)

2- FOOD SECURITY

3- HOMES

4- ENERGY, WATER and COMMUNICATION

5- COMMUNITY RESPONSE

**WE ARE
RESILIENT**



WE ARE COMMITTED TO REBUILDING A STRONGER AND SAFER PUERTO RICO



STEM and Resilience education at @ECOEXPLORATORIO
Museo de Ciencias de Puerto Rico
787-281-9090
info@ecoexploratorio.org



VISIT US: 2nd Floor-Plaza Las Américas



THANK YOU!

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